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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/532,313	11/14/2005	Jerome Assal	004501-810	9970

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EXAMINER	
JEFFERSON, QUOVAUNDA	

ART UNIT	PAPER NUMBER
2823	

DATE MAILED: 11/16/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/532,313	ASSAL ET AL.	
	Examiner	Art Unit	
	Quovaunda Jefferson	2823	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *23 August 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-11* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-11* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1, 3, 4, and 9 are rejected under 35 U.S.C. 102(b) as being anticipated by Lai et al, US Patent 6, 103,619.

Regarding claim 1, Lai teaches a method for forming a stepped profile from a layer sequence in which, in a first patterning step, a first layer partial sequence **66** is removed apart from a first residual layer partial sequence (Figure 9), in a second patterning step, a second layer partial sequence **64** located below the first layer partial sequence is partially removed by means of etching with a second etchant (Figure 10), in a third patterning step, a third layer partial sequence **62** located below the second layer partial sequence is partially removed by means of etching with a third etchant (Figure 12) wherein, in the second patterning step, a region of the second layer partial sequence **64** that is located below the first residual layer partial sequence **66** is removed, a first projection of the residual layer partial sequence **66** being formed

(Figure 10), and in the third patterning step, the first projection of the first residual layer partial sequence is removed (Figures 12 and 13)

Regarding claim 3, Lai teaches the first patterning step is carried out by means of etching with a first etchant (column 4, lines 1-7)

Regarding claim 4, Lai teaches a substantially identical chemical composition is chosen for the first etchant and for the third etchant (column 4, lines 1-7, lines 30-55).

Regarding claim 9, Lai teaches prior to the first patterning step, a protective layer **68** is provided on the first layer partial sequence **66** (Figure 8).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lai as applied to claim 1 above, and further in view of Sah, US Patent 6,297,161 (as previously cited).

Regarding claim 2, Lai fails to teach the second and third patterning steps are effected in aqueous solution. Sah teaches the second and third patterning steps are effected in aqueous solution. In particular, Sah teaches that multiples layers can be etched using wet-etching, specifically citing HNO_3 because the wet etching method has the advantage over dry etching of lower equipment costs and a much better selectivity (column 1, lines 44-69).

Therefore, it would be obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Sah with that of Lai because the wet etching method has the advantage over dry etching of lower equipment costs and a much better selectivity.

Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lai as applied to claim 1 above, and further in view of Ohori et al, US Patent 6,156,662 (as previously cited).

Regarding claim 5, Lai fails to teach in the first patterning step, the first layer partial sequence is removed to an extent such that a second projection of the protective layer arises, which second projection has a length t_1 greater than a thickness d_1 of the first layer partial sequence.

Ohori teaches in the first patterning step, the first layer partial sequence **46a** or **46b** is removed to an extent such that a second projection of the protective layer **48** arises, which second projection has a length t_1 greater than a thickness d_1 of the first layer partial sequence because barrier types patterns undergo certain recessions when as a result of using a wet etching process. (To further clarify, the dimensions of t_1 and d_1 for the Ohori, Figure 11 are the same as the dimensions that the applicant has specified in Figures 1 and 2. Therefore t_1 for Ohori is the length between the end of the protective layer **48** to the sidewall of **46a** or **46b** and d_1 is the thickness of **46a** or **46b**).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Ohori with that of Lai because barrier types patterns undergo certain recessions when as a result of using a wet etching process (Ohori, column 10, lines 24-25).

Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lai as applied to claim 1 above, and further in view of Wood et al, US Patent 3,663,184 (as previously cited).

Regarding claim 6, Lai fails to the first layer partial sequence substantially comprises Ag, the second layer partial sequence substantially comprises Ni, and the third layer partial sequence substantially comprises Ti.

Wood teaches the first layer partial sequence **20** substantially comprises Ag, the second layer partial sequence **16** substantially comprises Ni, and the third layer partial sequence **15** substantially comprises Ti because a pedestal for a solder bump pad could be formed with the three metal layers (column 3, line 42, column 4, lines 7, and column 4, line 41).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Wood with that of Lai because it would enable the practitioners of Lai to use this particular method of etching to form a pedestal for a solder bump pad could be formed with the three metal layers (column 3, line 42, column 4, lines 7, and column 4, line 41).

Claims 7 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lai as applied to claim 1 above, and further in view of Hadjizadeh-Amini, US Patent 5,200,351.

Regarding claim 7, Lai fails to teach an aqueous solution of nitric acid is used as a second etchant.

Hadjizadeh-Amini teaches an aqueous solution of nitric acid is used as a second etchant (column 4, lines 50-54) as part of an effective wet etching method using transcene, a combination of phosphoric acid, nitric acid, acetic acid, and water, in order to remove a nitride layer.

It would be obvious to one of ordinary skill in the art at the time of the invention to combine the teachings of Hadjizadeh-Amini with that of Lai because transcene, a combination of phosphoric acid, nitric acid, acetic acid, and water, is an effective wet etching method that is used in the art to remove a nitride layer.

Regarding claim 10, Lai and Hadjizadeh-Amini fail to teach an aqueous solution of nitric acid has a dilution ratio of 1:z where $2.0 < z < 8.0$. However, given the teaching of the references, it would have been obvious to determine the dilution ratio of etchant since dilution ratio is a well-known process variable as well as condition of delivery of the layers involved See *In re Aller, Lacey, and Hall* (10 USPQ 23 3-237) "It is not

inventive to discover optimum or workable ranges by routine experimentation. Note that the specification contains no disclosure of ether the critical nature of the claimed ranges or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the Applicant must show that tile chosen dimensions are critical. *In re Woodruff*, 919 f.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

Any differences in the claimed invention and the prior art may be expected to result in some differences in properties. The issue is whether the properties differ to such an extent that the difference is really unexpected. *In re Merck & Co.,* 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). Appellants have the burden of explaining the data in any declaration they proffer as evidence of non-obviousness. *Ex parte Ishizaka*, 24 USPQ2d 1621, 1624 (Bd. Pat. App. & Inter. 1992).

An Affidavit or declaration under 37 CFR 1.132 must compare the claimed subject matter with the closest prior art to be effective to rebut a prima facie case of obviousness. *In re Burckel*, 592 F.2d 1175, 201 USPQ 67 (CCPA 1979).

Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lai as applied to claim 3 above, and further in view of Kwag et al, US Patent Application Publication 2001/0006246.

Regarding claim 8, Lai fails to teach a mixture of hydrogen peroxide, ammonium hydroxide and water is used as the first and third etchants,

Kwag teaches teach a mixture of hydrogen peroxide, ammonium hydroxide and water is used as the first and third etchants [0028, 0035, 0037] as an effective etchant that is used, not only to etch an interlayer dielectric layer, but can etch effectively etch any other type of semiconductor layers.

It would be obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Wang with that of Lai because it would enable the practitioners of Lai an etchant t that is not only usable not only to etch an interlayer dielectric layer, but can etch effectively etch any other type of semiconductor layers.

Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lai and Kwag as applied to claim 8 above, and further in view of Swejkowski, US Patent 5,296,093.

Regarding claim 11, Lai and Kwag fail to teach a mixture of hydrogen peroxide, ammonium hydroxide and water has a volume ratio of approximately 1:x: y, where $0.5 < x < 2.0$ and $4.0 < y < 10.0$.

Swejkowski teaches a mixture of hydrogen peroxide, ammonium hydroxide and water has a volume ratio of approximately 1:x: y, where $0.5 < x < 2.0$ and $4.0 < y < 10.0$ (column 3, lines 46-56) as an improved process for performing an wet etching without undercutting the underlying area.

It would be obvious to one of ordinary skill in the art at the time of the invention to combine the teachings of Swejkowski with that of Lai and Kwag as an improved process for performing an wet etching without undercutting the underlying area.

Response to Arguments

Applicant has amended claims 1, 7, and 8. Claims 10 and 11 have been added and no claims have been cancelled. Claims 1-11 are pending in this application.

Applicant's arguments with respect to claims 1-11 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. US Patent 4,808,542, issued to Reichert et al, discloses a process for the stabilization of PN junction.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Quovaunda Jefferson whose telephone number is 571-

272-5051. The examiner can normally be reached on Monday through Friday, 8AM to 4:30PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Smith can be reached on 571-272-1907. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

QVJ
QVJ

Fernando L. Toledo
Primary Examiner
Art Unit: 2823